

What is Claimed is:

1. An insulating nitride layer formed from a group III-V nitride compound semiconductor heavily doped mostly with a group IIB element.

2. An insulating nitride layer as defined in Claim 1, which is heavily doped substantially with said group IIB element as an impurity.

3. An insulating nitride layer as defined in Claim 2, which is heavily doped with at least zinc among said group IIB elements.

4. An insulating nitride layer as defined in Claim 1, which is doped with said group IIB element in an amount not less than $1 \times 10^{17}/\text{cm}^3$.

5. An insulating nitride layer as defined in Claim 1, in which said group III-V nitride compound semiconductor is GaN, AlN, InN, or BN, or a mixture thereof.

6. An improved process for forming a layer of group III-V nitride compound semiconductor by vapor deposition, wherein said improvement comprising feeding a reactant gas for said group III-V compound semiconductor together with a gas containing an impurity whose vapor pressure is equal to or higher than 10 mmHg at room temperature, thereby forming an insulating nitride layer

which is heavily doped with said impurity.

7. A process for forming an insulating nitride layer as defined in Claim 6, in which said impurity-containing gas is mainly a compound gas of group IIB element.

8. A process for forming an insulating nitride layer as defined in Claim 7, in which said impurity-containing gas is substantially a compound gas of group IIB element.

9. A process for forming an insulating nitride layer as defined in Claim 8, in which said compound gas is a gas of zinc compound.

10. A process for forming an insulating nitride layer as defined in Claim 9, in which said compound gas is an alkyl zinc such as diethyl zinc and dimethyl zinc.

11. A process for forming an insulating nitride layer as defined in Claim 6, in which said impurity is added in an amount not less than $1 \times 10^{17}/\text{cm}^3$.

12. A process for forming an insulating nitride layer as defined in Claim 6, in which said group III-V nitride compound semiconductor is GaN, AlN, InN, or BN, or a mixture thereof.

13. A semiconductor device which has an insulating nitride layer formed from a group III-V nitride compound

semiconductor heavily doped mostly with a group IIB element.

14. A semiconductor device as defined in Claim 13, in which said group III-V nitride compound semiconductor is used at least part of its constituents for isolation of one or more kinds of integrated elements including field effect transistor, bipolar transistor, light-emitting diode, semiconductor laser, and photodiode.

15. A semiconductor device as defined in Claim 13, in which an active layer is formed on said insulating nitride layer.

16. A semiconductor device as defined in Claim 13, in which the insulating nitride layer is heavily doped substantially with said group IIB element as an impurity.

17. A semiconductor device as defined in Claim 16, in which the insulating nitride layer is heavily doped with at least zinc among said group IIB elements.

18. A semiconductor device as defined in Claim 13, in which the insulating nitride layer is doped with said group IIB element in an amount not less than $1 \times 10^{17}/\text{cm}^3$.

19. A semiconductor device as defined in Claim 13 or 14, in which said group III-V nitride compound semiconductor is GaN, AlN, InN, or BN, or a mixture thereof.

0923133 000001
20. A process for producing a semiconductor device which has an insulating nitride layer formed from a group III-V nitride compound semiconductor heavily doped mostly with a group IIB element, said process comprising a step of forming a layer of group III-V nitride compound semiconductor by vapor deposition from a reactant gas for said group III-V compound semiconductor which is fed together with a gas containing an impurity whose vapor pressure is equal to or higher than 10 mmHg at room temperature, thereby forming an insulating nitride layer which is heavily doped with said impurity, and a step of growing an active layer on said insulating nitride layer by vapor deposition.

21. A process for producing a semiconductor device as defined in Claim 20, in which said group III-V nitride compound semiconductor is used at least part of its constituents for isolation of one or more kinds of integrated elements including field effect transistor, bipolar transistor, light-emitting diode, semiconductor laser, and photodiode.

22. A process for producing a semiconductor device as defined in Claim 20, in which said impurity-containing gas is mainly a compound gas of group IIB element.

23. A process for producing a semiconductor device

as defined in Claim 22, in which said impurity-containing gas is substantially a compound gas of group IIB element.

24. A process for producing a semiconductor device as defined in Claim 23, in which said compound gas is a gas of zinc compound.

25. A process for producing a semiconductor device as defined in Claim 24, in which said compound gas is an alkyl zinc such as diethyl zinc and dimethyl zinc.

26. A process for producing a semiconductor device as defined in Claim 20, in which said impurity is added in an amount not less than $1 \times 10^{17}/\text{cm}^3$.

27. A process for producing a semiconductor device as defined in Claim 20, in which said group III-V nitride compound semiconductor is GaN, AlN, InN, or BN, or a mixture thereof.